US007366720B2

(12) **United States Patent**
Deshpande

(10) **Patent No.: US 7,366,720 B2**
(45) **Date of Patent: Apr. 29, 2008**

(54) **SYSTEM FOR REMOTE SHARE ACCESS**

(75) Inventor: **Sachin Deshpande**, Vancouver, WA (US)

(73) Assignee: **Sharp Laboratories of America**, Camas, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 443 days.

(21) Appl. No.: **10/961,285**

(22) Filed: **Oct. 7, 2004**

(65) **Prior Publication Data**

US 2005/0149508 A1 Jul. 7, 2005

Related U.S. Application Data

(60) Provisional application No. 60/535,187, filed on Jan. 6, 2004, provisional application No. 60/535,119, filed on Jan. 6, 2004.

(51) **Int. Cl.**
G06F 17/30 (2006.01)

(52) **U.S. Cl.** **707/9**; 709/226

(58) **Field of Classification Search** 707/3
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,226,680	B1 *	5/2001	Boucher et al.	709/230
2002/0152299	A1 *	10/2002	Traversat et al.	709/223
2002/0161865	A1 *	10/2002	Nguyen	709/220
2003/0088544	A1 *	5/2003	Kan et al.	707/3
2003/0101294	A1 *	5/2003	Saint-Hilaire et al.	710/11
2004/0039781	A1 *	2/2004	LaVallee et al.	709/205
2004/0044725	A1 *	3/2004	Bell et al.	709/203
2004/0068524	A1 *	4/2004	Aboulhosn et al.	707/200

OTHER PUBLICATIONS

Wikipedia "SMBS", the Encyclopedia of Internet.*
Implement CIFS: The common Internet File System, Prentice Hall, Aug. 11, 2003, Sec. 22.3.5, Rap Annoyances, last paragraph, lines 1-3.*
Theotokis et al. "A Suvey of Peer to Peer File Sharing Technologies", ELTRUN, 2002, p. 1-31.*
LimeWire "A File Sharing Program Running on the Gnutella Network", 2002.*

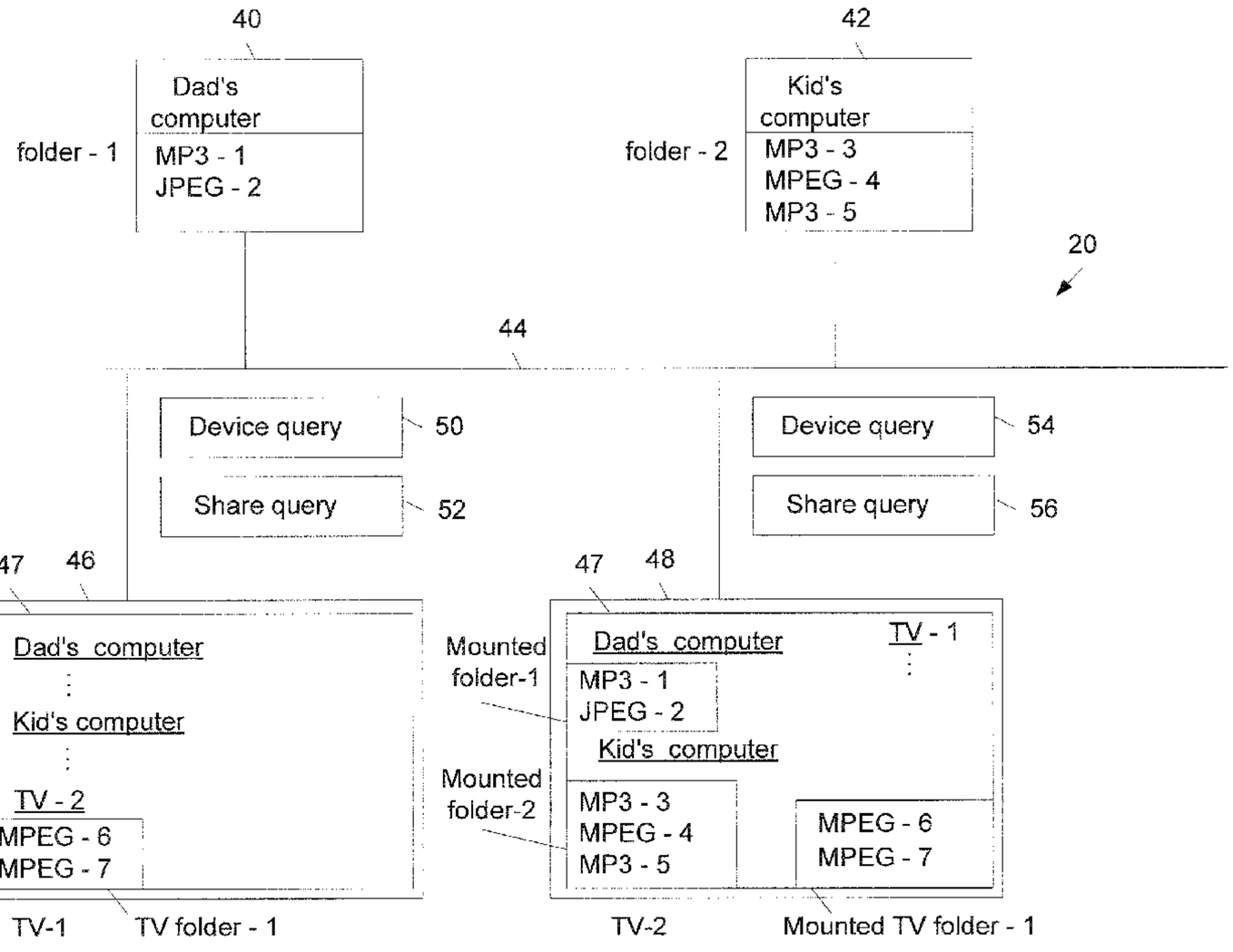
* cited by examiner

Primary Examiner—Charles Rones
Assistant Examiner—Yuk Choi
(74) *Attorney, Agent, or Firm*—Stolowitz Ford Cowger LLP

(57) **ABSTRACT**

A distributed share folder & file discovery system allows different local computers to discover hosts and share folders without having to go through a central master browser. The local computer sends a device name query directly to any remote devices connected to a same network. The local computer then sends out a share query to the remote devices identified during the device name query to identify any folders or files that are available for sharing (shares). The local computer assembles a list of shares available on the remote devices and mounts any of the shares that are selected from the list.

24 Claims, 5 Drawing Sheets



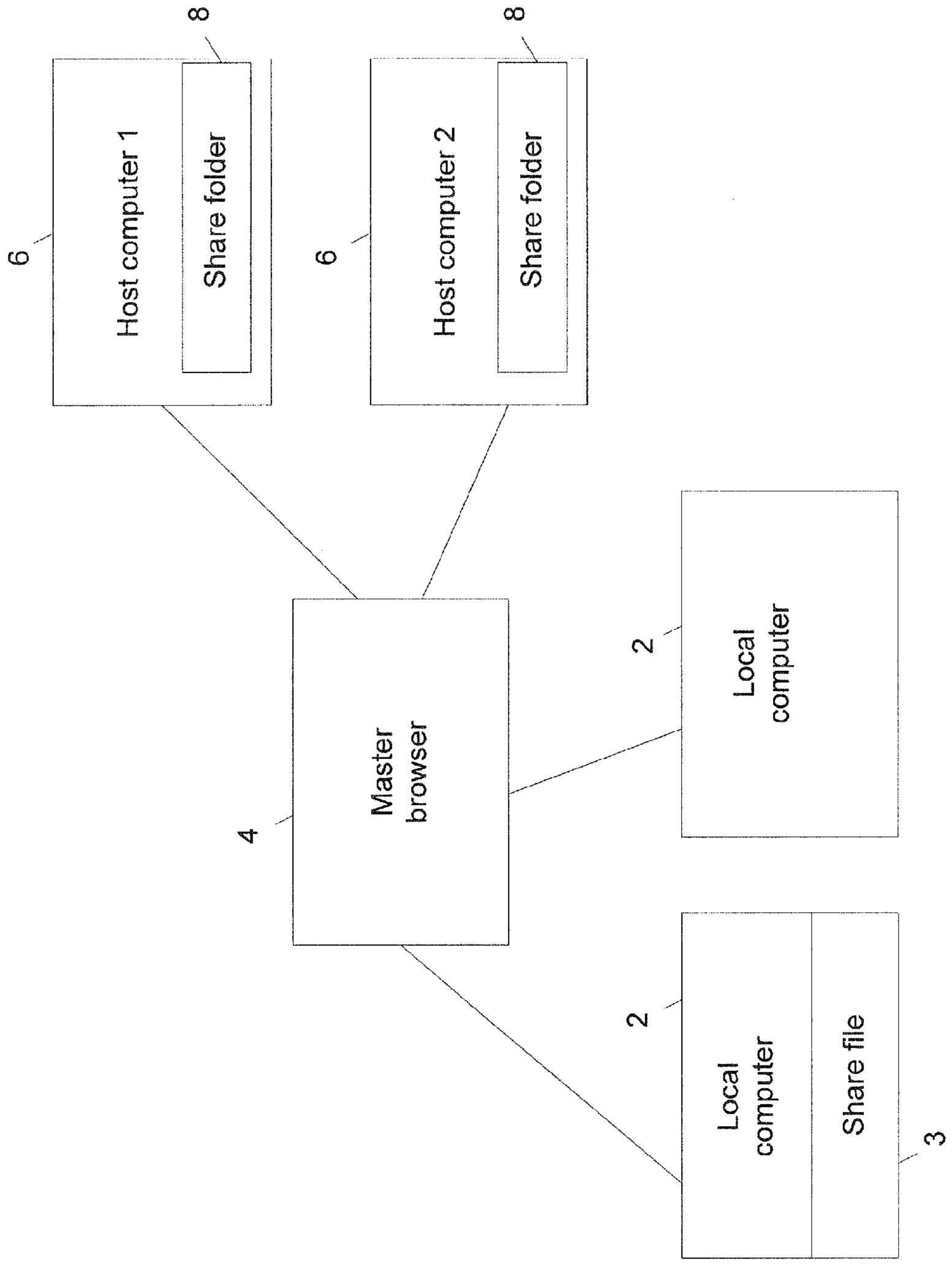


FIG. 1
(background)

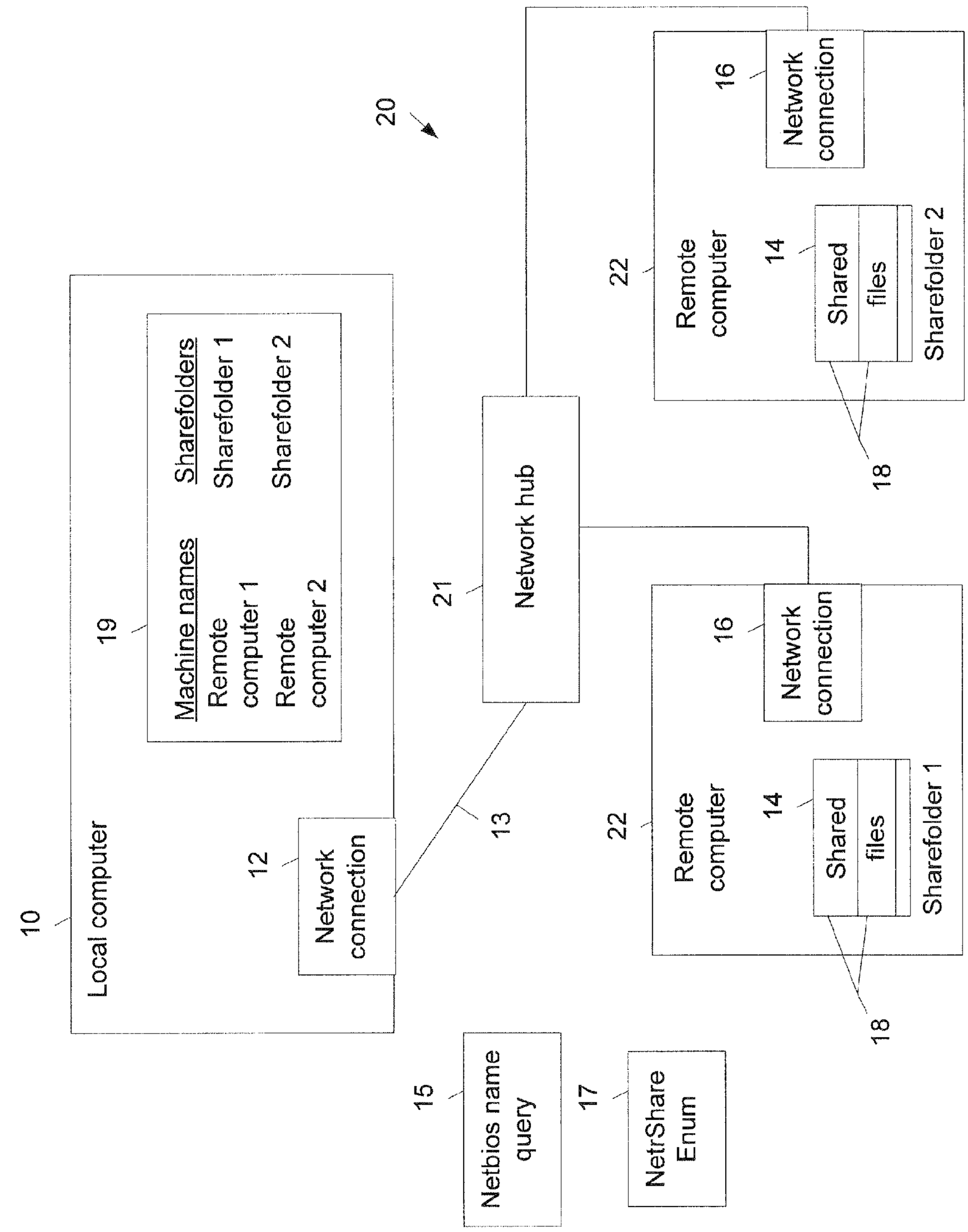

20
10
Local computer
19
Machine names
Remote computer 1
Remote computer 2
Sharefolders
Sharefolder 1
Sharefolder 2
12
Network connection
13
21
Network hub
22
Remote computer
16
Network connection
14
Shared files
Sharefolder 1
18
22
Remote computer
16
Network connection
14
Shared files
Sharefolder 2
18
15
Netbios name query
17
NetrShare Enum

FIG. 2

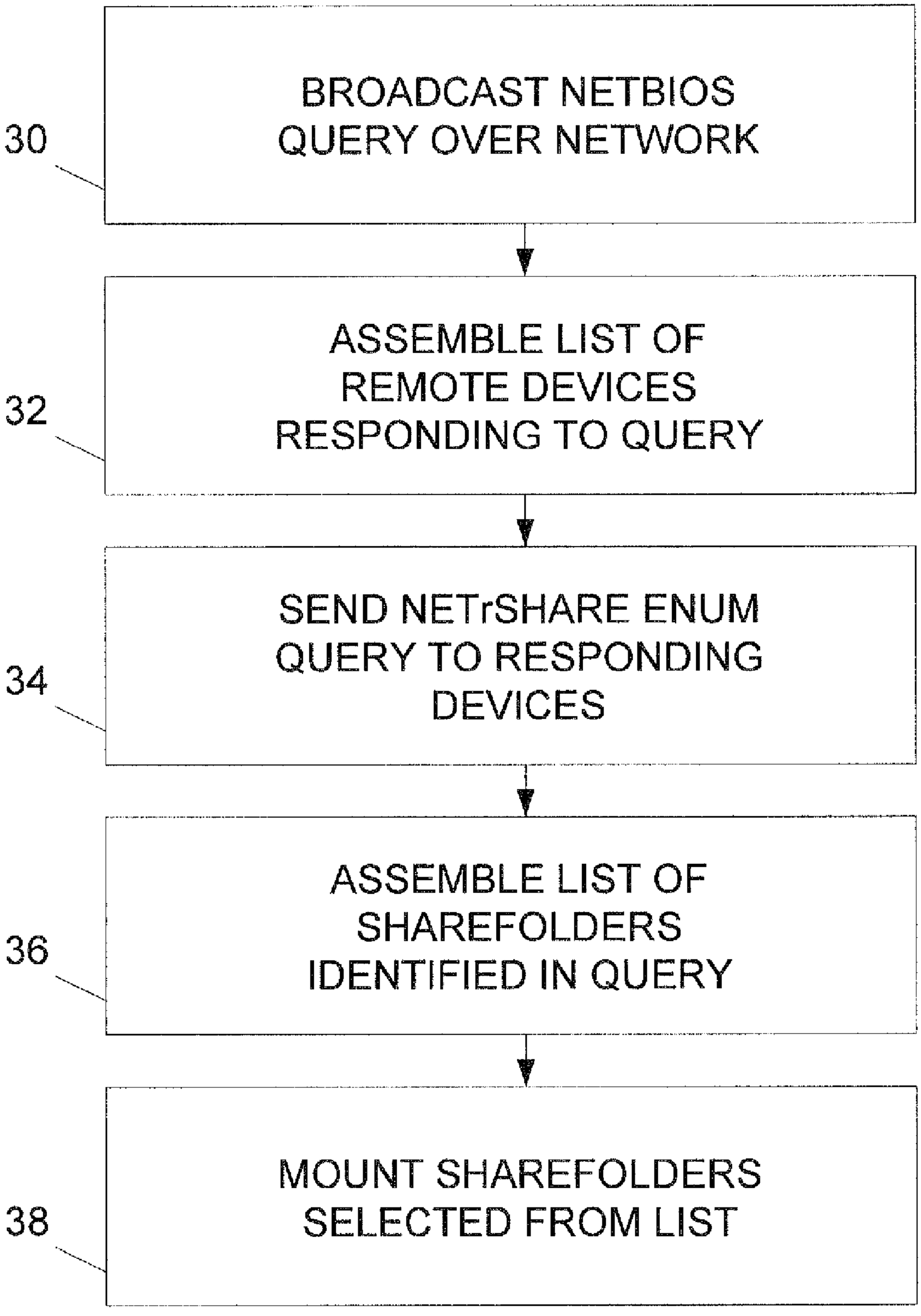

30
BROADCAST NETBIOS QUERY OVER NETWORK
32
ASSEMBLE LIST OF REMOTE DEVICES RESPONDING TO QUERY
34
SEND NETrSHARE ENUM QUERY TO RESPONDING DEVICES
36
ASSEMBLE LIST OF SHAREFOLDERS IDENTIFIED IN QUERY
38
MOUNT SHAREFOLDERS SELECTED FROM LIST

FIG. 3

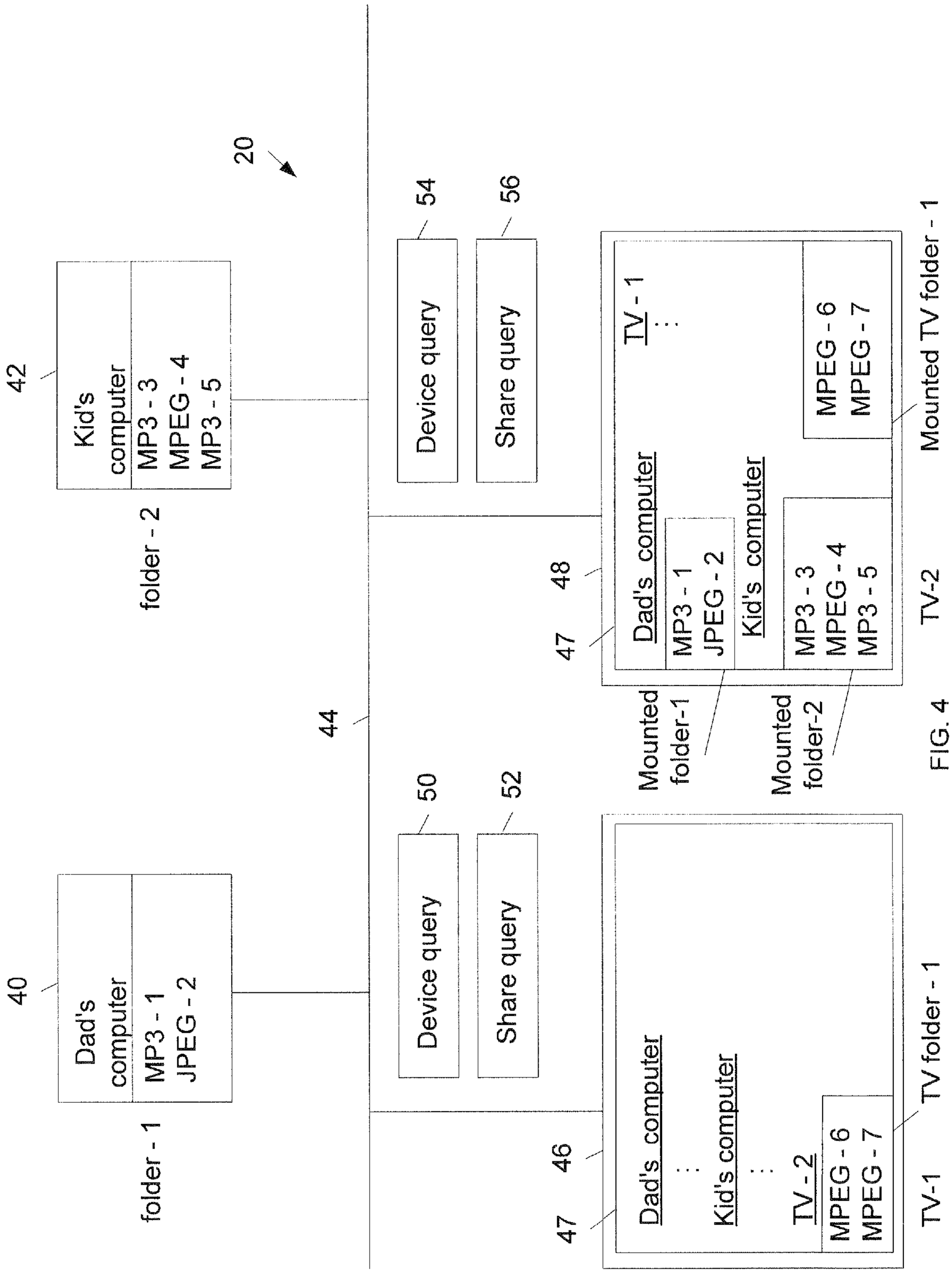

20
42
Kid's computer
MP3 - 3
MPEG - 4
MP3 - 5
folder - 2
54
56
Device query
Share query
Mounted folder - 1
TV - 1
Dad's computer
MP3 - 1
JPEG - 2
Kid's computer
MP3 - 3
MPEG - 4
MP3 - 5
MPEG - 6
MPEG - 7
Mounted TV folder - 2
48
47
44
50
52
Device query
Share query
Mounted folder-1
Mounted folder-2
TV-2
40
Dad's computer
MP3 - 1
JPEG - 2
folder - 1
Device query
Share query
46
47
Dad's computer
Kid's computer
TV - 2
MPEG - 6
MPEG - 7
TV-1
TV folder - 1

FIG. 4

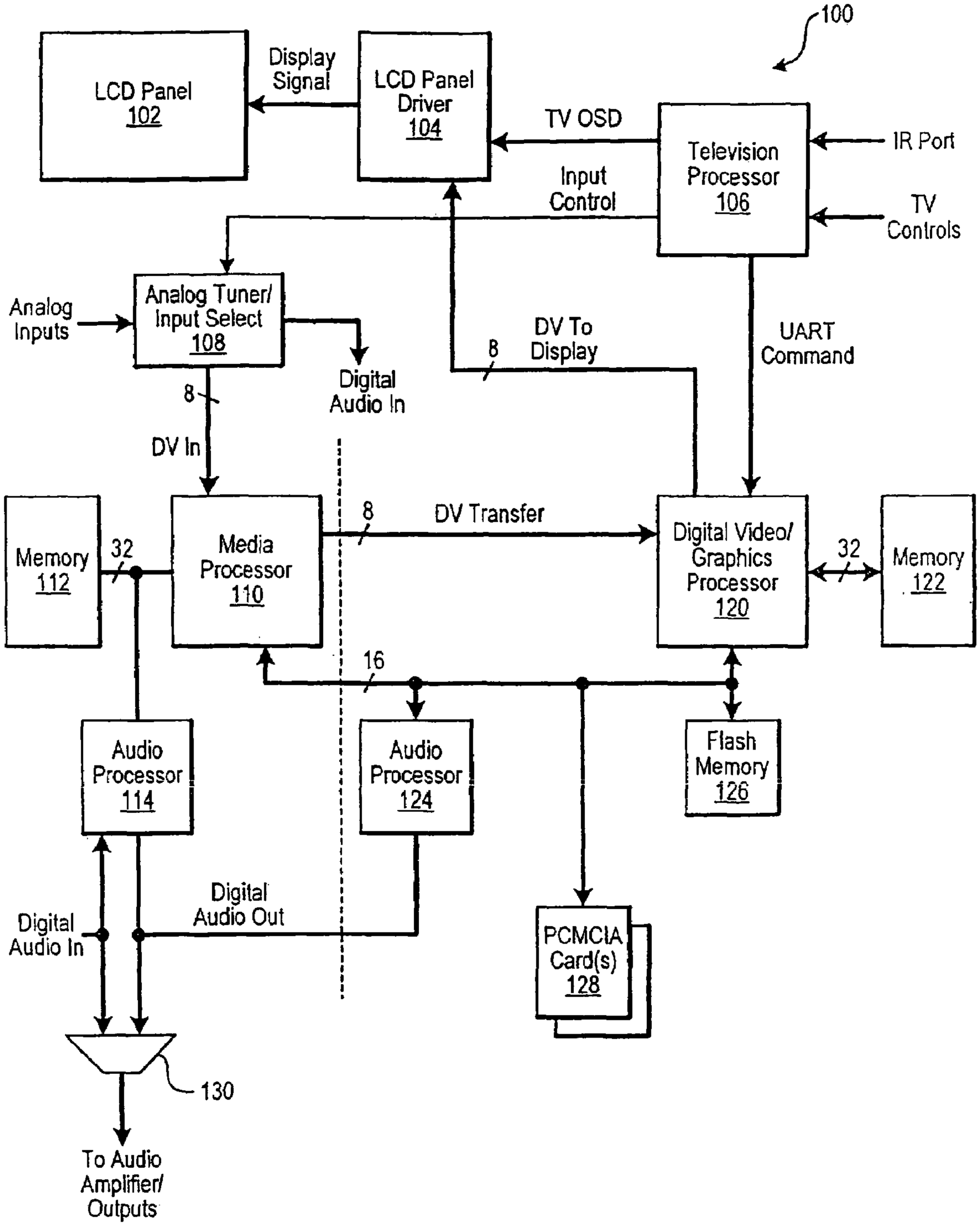

100
LCD Panel
102
Display
Signal
LCD Panel
Driver
104
TV OSD
Input
Control
Television
Processor
106
IR Port
TV
Controls
Analog
Inputs
Analog Tuner/
Input Select
108
8
DV In
Digital
Audio In
8
DV To
Display
UART
Command
Memory
112
32
Media
Processor
110
8
DV Transfer
Digital Video/
Graphics
Processor
120
32
Memory
122
16
Audio
Processor
114
Audio
Processor
124
Flash
Memory
126
Digital
Audio Out
Digital
Audio In
PCMCIA
Card(s)
128
130
To Audio
Amplifier/
Outputs

fig. 5

SYSTEM FOR REMOTE SHARE ACCESS

RELATED APPLICATIONS

This application claims priority from provisional patent application Ser. No. 60/535,187, filed Jan. 6, 2004, entitled: SYSTEM FOR REMOTE SHARE ACCESS. This application is also related to another provisional patent application Ser. No. 60/535,119, filed Jan. 6, 2004, entitled: INTELLIGENT DISCOVERY OF SHARES, the contents of which are hereby incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

1. Technical Field

This disclosure relates to computer networks, and, more specifically, to a system for sharing files over a computer network.

2. Description of the Related Art

Referring to FIG. **1**, software programs exist that allow computers to share files. One example is the Microsoft® Windows® folder sharing. A user tags folders, such as folders **8** on host computers **6** as available for sharing with other computers. The user might also assign a password to the tagged folders **8**. A local computer **2** that wants to discover the hosts (and their shared folders **8**) has to access a central computer that operates as master browser **4**.

The master browser **4** discovers the hosts **6** from their announcement messages and relays the shared folder information to the local computer **2**. The local computer **2** displays a list of all the hosts. The local computer can then discover share folders from any of the hosts. A user can then select any of the share folder **8** for mounting and use the share files **3** in the mounted share folder **8** on the local computer **2**. Mounting allows the local computer **2** to utilize the share files **3** as if they were available locally. The Windows Browser Service is described at

http://www.microsoft.com/resources/documentation/windows/2000/server/reskit/en-us/tcpip/part4/tcpappi.mspx.

Current network neighborhood programs use centralized discovery. Centralized discovery uses a centralized master browser **4** on the network for discovering the host computers **6**. Some networks, such as a user's home network, may not be set up with a master browser **4**. In these networks, there is no way for local computers **2** to discover hosts on the network and then in turn discover their shares using above approach. Further, centralized discovery systems may require excessive time to identify new host computers that are recently attached to the network. Thus, the centralized discovery approach is not effective for certain network systems.

Embodiments of the invention address these and other limitations in the prior art.

SUMMARY OF THE INVENTION

A distributed share file discovery system allows different local computers to discover hosts and share folders without having to go through a central master browser. The local computer sends a device name query directly to any remote devices connected to a same network. The local computer then sends out a share query to the remote devices identified during the device name query to identify any folders or files that are available for sharing (shares). The local computer assembles a list of shares available on the remote devices and mounts any of the shares that are selected from the list.

The foregoing and other features and advantages of the invention will become more readily apparent from the following detailed description of a preferred embodiment of the invention that proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of centralized share file discovery system.

FIG. **2** is a block diagram of a distributed share file discovery system.

FIG. **3** is a flow diagram describing the operation of the distributed share file discovery system shown in FIG. **2**.

FIG. **4** is a block diagram of a home network that utilizes the distributed share file discovery system.

FIG. **5** is a detailed diagram for one of the television systems used in the home network shown in FIG. **4**.

DETAILED DESCRIPTION

FIG. **2** is a block diagram of a distributed share file discovery system **20**. A local computer **10** has a network connection **12** to a network hub **21**. The local computer **10** can be any type of computing device including a Personal Computer (PC), television system, stereo system, etc. that may need to access or share files from or with other devices. Although FIG. **2** illustrates the network connection **12** as a wired connection, the connection **12** may also be wireless. In this case the network hub **21** may be a wireless access point.

The network hub **21** is also connected to two remote computers **22**, such as PCs, servers, television system, audio system, or any other type of computing system that may have content that is available for sharing with local computer **10**. Each remote computer **22** has a network connection **16**. In alternate embodiments, the local computer **10** and remote computers **22** may each be connected to a common network **13** without using the network hub **21**. For example cross-over cables or wireless Ad-Hoc connection modes may be used. In alternate embodiments the network connection may use other network technologies e.g. Infra Red, USB, Powerline etc.

One or both of the remote computers **22** contain one or more folders **14** that hold files **18**. Conventional network protocols, for example, the Microsoft® Windows® sharing option, can be used for designating the folders **14** as share folders. Designating a share folder allows the folder **14** on the remote computers **22** to be shared with other devices, such as local computer **10**. Folders or files designated as available for sharing with other computing systems will be referred to as "shares".

Referring to FIGS. **2** and **3**, in one embodiment of the invention, a NetBIOS name query **15** is broadcast over network **13** by the local computer **10** in block **30** (FIG. **3**). The NetBIOS name query **15** discovers hosts, Server Message Blocks (SMBs)/Common Internet File System (CIFS) servers, or any other device on the network **13**.

NetBIOS is an acronym for Network Basic Input Output System, which is an Application Program Interface (API) or program that augments a computer's Basic Input Output System (BIOS) by adding special functions for Local Area Networks (LANs).

NetBIOS was designed for use by groups of PCs, sharing a broadcast medium. Both connection (Session) and connectionless (Datagram) services are provided, and broadcast and multicast are supported. Participants are identified by name. Assignment of names is distributed and highly

dynamic. Request For Comment (RFC) 1001 available at http://www.ietf.org/rfc/rfc1001.txt defines concepts and methods and a protocol standard for a NetBIOS service on a TCP/UDP transport which is herein incorporated by reference.

Each of the computers **10** and **22** support the NetBIOS functions and can communicate over the network **13** using NetBIOS commands and features, as well as other typical network commands and features.

In this example, the NetBIOS name query **15** is sent using a broadcast address by local computer **10** to discover the remote computers **22**. The NetBIOS query **15** can also be used to identify server services on the network **13** by using a particular service number, such as the service number **20**. In response to the NetBIOS name query **15**, each remote computer **22** sends back its Internet Protocol (IP) address along with some additional information flags. In block **32**, the local computer **10** receives the responses from the remote computers **22** and assembles a list of all the hosts or servers on network **13**.

In block **34** (FIG. **3**), the local computer **10** sends a NetrShareEnum request **17** to each of the identified servers or hosts, such as remote computers **22**. The NetrShareEnum request **17** is defined by the SMB protocol that queries each of the remote computers **22** for any share folders or files. In response to the NetrShareEnum request **17**, the remote computers **22** identify any previously designated share folders **14**. In block **36** (FIG. **3**), the local computer **10** assembles a list **19** identifying the names of all the computers discovered in the NetBIOS name query **15** and listing all the share folders identified on those computers during the NetrShareEnum query **17**.

In block **38**, the list **19** is displayed on the local computer **10**. A user can select any of the folders displayed in list **19**. Selecting a displayed folder initiates a mount operation. If the shared folders have an associated password, then the local computer **10** may present a password prompt after the user selects the share folder or this information (username, password) may be preconfigured by the user. The mount operation causes the selected folder to operate as if available locally on computer **10**. In one embodiment, the mounting operation uses a series of SMB and CIFS messages that allow any applications operating on the local computer **10** to be performed on the share folders. For example, an application on local computer **10** that plays an MPEG file.

The local computer **10** may store a list of the particular folders that are selected for mounting by the user. The next time the local computer **10** is operated, the local computer **10** can automatically mount the folders that were previously selected for mounting from the earlier discovery and mounting session.

The local computer **10** can save the Internet Protocol (IP) address and the NetBIOS name of the discovered devices on network **13**. Some of the previously discovered machines may not be discovered during a next discovery session. The local computer **10** can send a NetrShareEnum request **17** or try to mount previously listed folders for computers that were identified in previous discovery sessions, but not necessarily discovered in the latest discovery session. This has the advantage of allowing the local computer **10** to attempt to mount and access shared folders without having to wait for discovery responses back from the remote computers **22** in a subsequent discovery session.

The NetBIOS query and remote computer response (request/response) protocol can provide faster share folder identification than centralized browser systems. The centralized browser systems often have to wait to receive a notification from new devices that are connected to the network. This can take several minutes for a new device to advertise and the centralized browser to then detect the existence of the new device on the network. However, the queries **15** sent by the local computer can immediately identify new devices on the Network.

QUERY EXAMPLES

In the description below, the term server refers to one of the remote computers **22** having share folders **14**, and the term client refers to the local computer **10**. The following processes are example processes that may be used by the client to access the remote share folders **14**.

The NetBIOS query **15** may be sent to discover all hosts on the network **13**. An example network transaction for this is shown below:

NetBIOS Name query from client to the network:

```
NetBIOS Name Service
    Transaction ID: 0x7602
        Flags: 0x0110 (Name query)
            0... .... .... .... = Query
            .000 0... .... .... = Name query
            .... ..0. .... .... = Message is not truncated
            .... ...1 .... .... = Do query recursively
            .... .... ...1 .... = Broadcast packet
        Questions: 1
        Answer RRs: 0
        Authority RRs: 0
        Additional RRs: 0
        Queries
*<00><00><00><00><00><00><00><00><00><00><00><00><00><00><00><00>
<00><00><00>: type NB, class inet
```

Alternately the discovery may be done for all hosts with "server" service (SMB/CIFS servers) on the network **13**. An example network transaction for this is shown below:

Network Name query from client to the network:

```
NetBIOS Name Service
    Transaction ID: 0x3301
    Flags: 0x0110 (Name query)
        0... .... .... .... = Query
        .000 0... .... .... = Name query
        .... ..0. .... .... = Message is not truncated
        .... ...1 .... .... = Do query recursively
        .... .... ...1 .... = Broadcast packet
    Questions: 1
    Answer RRs: 0
    Authority RRs: 0
    Additional RRs: 0
    Queries
        *SMBSERVER      <20>: type NB, class inet
```

Each host **22** for the first case above and\or SMB/CIFS server **22** for the second case above responds to the NetBIOS name query **15**. An example network transaction for this is shown below. Only the response from one CIFS server for the second case above is shown below. In general, the client **10** should receive a response from all the SMB/CIFS servers on the network.

NetBIOS Name query response from one CIFS server to the client:

```
NetBIOS Name Service
    Transaction ID: 0x3301
    Flags: 0x8500 (Name query response, No error)
        1... .... .... .... = Response
        .000 0... .... .... = Name query
        .... .1.. .... .... = Server is an authority for
domain
        .... ..0. .... .... = Message is not truncated
        .... ...1 .... .... = Do query recursively
        .... .... 0... .... = Server can't do recursive
queries
        .... .... ...0 .... = Not a broadcast packet
        .... .... .... 0000 = No error
    Questions: 0
    Answer RRs: 1
    Authority RRs: 0
    Additional RRs: 0
    Answers
*SMBSERVER      <20>: type NB, class inet
    Name: *SMBSERVER      <20> (Server service)
    Type: NB
    Class: inet
    Time to live: 3 days, 11 hours, 20 minutes
    Data length: 6
    Flags: 0x6000 (H-node, unique)
        0... .... .... .... = Unique name
        .11. .... .... .... = H-node
    Addr: 192.168.0.11
```

Share folders for the each individual host/CIFS server are enumerated. This consists of a NetrShareEnum request **17** sent by the client **10** to each individual host or to each individual SMB/CIFS server. The host or SMB/CIFS server **22** responds to the request with a list of exported remote share folders **14**. An example network transaction for this is shown below:

NetrShareEnum request from client to server:

```
NetBIOS Session Service
    Message Type: Session message
    Flags: 0x00
    Length: 180
SMB (Server Message Block Protocol)
    SMB Header
SMB Pipe Protocol
    Function: TransactNmPipe (0x0026)
    FID: 0x181d
DCE RPC
Microsoft Server Service
    Operation: NetrShareEnum (15)
    Server: \\Vidabcd01
        Referent ID: 0x042c458c
        Max Count: 13
        Offset: 0
        Actual Count: 13
        Server: \\Vidabcd01
    Shares
        Info Level: 1
        Info Level: 1
        SHARE_INFO_1_CONTAINER:
            Referent ID: 0x0972e1cc
            Number of entries: 0
            (NULL pointer) SHARE_INFO_1 array:
    Preferred length: 4294967295
    (NULL pointer) Enum Handle
```

The host or SMB/CIFS server **22** responds to the NetrShareEnum request **17** with a list of exported remote share folders **14**. An example network transaction for this is shown below.

NetrShareEnum reply from server to client:

```
NetBIOS Session Service
    Message Type: Session message
    Flags: 0x00
    Length: 656
SMB (Server Message Block Protocol)
    SMB Header
SMB Pipe Protocol
    Function: TransactNmPipe (0x0026)
    FID: 0x181d
DCE RPC
Microsoft Server Service
    Operation: NetrShareEnum (15)
    Shares
        Info Level: 1
        Info Level: 1
        SHARE_INFO_1_CONTAINER: ADMIN$ IPC$ oa
            Referent ID: 0x00180388
            Number of entries: 3
            SHARE_INFO_1 array: ADMIN$ IPC$ oa
    ...
```

The client **10** gathers names of the remote share folders **14** using the above processes for each SMB/CIFS server on the network **13**. In some embodiments the client **10** may display this list **19** of server names with their remote share names to a user. The user may then select one or more shares from one or more servers to be "mounted" as described below. Alternately, the client **10** may automatically or using some pre-defined criterion or algorithm may select one or more remote share folders **14** to be "mounted".

The selected remote shares from the above operation are mounted by the client **10**. This can be done using the SMB/CIFS protocol. The operation involved include using one or more of the following SMB/CIFS protocol messages: SMB_COM_NEGOTIATE, SMB_COM_SESSION_SETUP_ANDX, SMB_COM_TREE_CONNECT_ANDX, etc.

The client **10** can then perform file and/or directory (folder) operations on the mounted files and directories. This operation may involve using one or more of the following SMB/CIFS protocol messages: SMB_COM_OPEN_ANDX, SMB_COM_READ, SMB_COM_WRITE, SMB_COM_CLOSE, etc.

After the file and/or directory operations are complete, the client **10** may disconnect the remote share folder **14**. This may include using one or more of the following SMB/CIFS protocol messages: SMB_COM_TREE_DISCONNECT, etc.

Although the above description uses CIFS protocol for accessing "remotely exported" file shares, in other embodiments alternate protocols such as Network File System (NFS), other remote file system protocols etc. can alternatively be used, as is known in the art.

Applications

Many homes, offices, dorms, or other areas have computers that store media files, such as pictures, audio files, and video files. Many of these places also include more than one computer networked together. The distributed share file discovery system **20** allows media files, or any other type of file, stored on a remote computer to be accessed and played locally over a network by a local device.

FIG. **4** shows televisions **46** and **48** each having a large screen **47** that can play video clips, audio files, or show pictures that are stored elsewhere on a computer network **44**. The computer network **44** is connected to two personal computers (PCs) **40** and **42**, television **46** and television **48**.

The first PC **40** contains a share folder—folder**1** which contains an MP3 file having the name MP3-1 and a JPEG file having the name JPEG-2. The second PC **42** includes a share folder—folder**2** which contains a MP3 file having the name MP3-3, an MPEG file named MPEG-4 and another MP3 file named MP3-5. The first PC **40** is given the name Dad's Computer and the second PC **42** is given the name Kid's Computer. The television **46** contains a share folder—TVFolder**1** containing two local files with the names MPEG-6 and MPEG-7.

The distributed discovery system **20** allows any of the devices **40**, **42**, **46** or **48** to individually discover share folders from other devices on network **44**. For example, the television **46** can broadcast a device query **50** and subsequently a share query **52** to the other devices in the network **44**. Similarly, the television **48** can also send device query **54** and share query **56** to the other devices on the network **44**. Of course, the PCs **40** or **42** can also send device query and share queries. The device can mount selected share folders.

The television **46** displays the mounted folders on Dad's Computer **40** and discovered on the Kid's Computer **42** and also displays any mounted folders on television **48**. Similarly, the television **48** displays the share folders discovered on the other devices **40**, **42** and **46**. Any of the files in the mounted folders can then be selected and then played out by the local device. Embodiments of the invention can operate on any properly networked device, which can be broadly interpreted, and is not limited to a typical computer network.

FIG. **5** shows in more detail a networked entertainment device, such as television **46** or **48** that can operate the distributed discovery and share system described above. FIG. **5** is a block diagram for a Liquid Crystal Display (LCD) television capable of operating according to some embodiments of the present invention. A television (TV) **100** includes an LCD panel **102** to display visual output to a viewer based on a display signal generated by an LCD panel driver **104**. The LCD panel driver **104** accepts a primary digital video signal, which may be in a CCIR656 format (eight bits per pixel YC_bC_r, in a "4:2:2" data ratio wherein two C_b and two C_r pixels are supplied for every four luminance pixels), from a digital video/graphics processor **120**.

A television processor **106** (TV processor) provides basic control functions and viewer input interfaces for the television **100**. The TV processor **106** receives viewer commands, both from buttons located on the television itself (TV controls) and from a handheld remote control unit (not shown) through its IR (Infra Red) Port. Based on the viewer commands, the TV processor **106** controls an analog tuner/input select section **108**, and also supplies user inputs to a digital video/graphics processor **120** over a Universal Asynchronous Receiver/Transmitter (UART) command channel. The TV processor **106** is also capable of generating basic On-Screen Display (OSD) graphics, e.g., indicating which input is selected, the current audio volume setting, etc. The TV processor **106** supplies these OSD graphics as a TV OSD signal to the LCD panel driver **104** for overlay on the display signal.

The analog tuner/input select section **108** allows the television **100** to switch between various analog (or possibly digital) inputs for both video and audio. Video inputs can include a radio frequency (RF) signal carrying broadcast television, digital television, and/or high-definition television signals, NTSC video, S-Video, and/or RGB component video inputs, although various embodiments may not accept each of these signal types or may accept signals in other formats (such as PAL). The selected video input is converted to a digital data stream, DV In, in CCIR656 format and supplied to a media processor **110**.

The analog tuner/input select section **108** also selects an audio source, digitizes that source if necessary, and supplies that digitized source as Digital Audio In to an Audio Processor **114** and a multiplexer **130**. The audio source can be selected—independent of the current video source—as the audio channel(s) of a currently tuned RF television signal, stereophonic or monophonic audio connected to television **100** by audio jacks corresponding to a video input, or an internal microphone.

The media processor **110** and the digital video/graphics processor **120** (digital video processor) provide various digital feature capabilities for the television **100**, as will be explained further in the specific embodiments below. In some embodiments, the processors **110** and **120** can be TMS320DM270 signal processors, available from Texas Instruments, Inc., Dallas, Tex. The digital video processor **120** functions as a master processor, and the media processor **110** functions as a slave processor. The media processor **110** supplies digital video, either corresponding to DV In or to a decoded media stream from another source, to the digital video/graphics processor **120** over a DV transfer bus.

The media processor **110** performs MPEG (Moving Picture Expert Group) coding and decoding of digital media streams for television **100**, as instructed by the digital video processor **120**. A 32-bit-wide data bus connects memory **112**, e.g., two 16-bit-wide×1M synchronous DRAM devices connected in parallel, to processor **110**. An audio processor **114** also connects to this data bus to provide audio coding and decoding for media streams handled by the media processor **110**.

The digital video processor **120** coordinates (and/or implements) many of the digital features of the television **100**. A 32-bit-wide data bus connects a memory **122**, e.g., two 16-bit-wide×1M synchronous DRAM devices connected in parallel, to the processor **120**. A 16-bit-wide system bus connects the digital video processor **120** to the media processor **110**, an audio processor **124**, flash memory **126**, and removable PCMCIA cards **128**. The flash memory **126** stores boot code, configuration data, executable code, and Java code for graphics applications, etc. PCMCIA cards **128** can provide extended media and/or application capability. The digital video processor **120** can pass data from the DV transfer bus to the LCD panel driver **104** as is, and/or processor **120** can also supercede, modify, or superimpose the DV Transfer signal with other content.

The multiplexer **130** provides audio output to the television amplifier and line outputs (not shown) from one of three sources. The first source is the current Digital Audio In stream from the analog tuner/input select section **108**. The second and third sources are the Digital Audio Outputs of audio processors **114** and **124**. These two outputs are tied to the same input of multiplexer **130**, since each audio processor **114**, **124**, is capable of tri-stating its output when it is not selected. In some embodiments, the processors **114** and **124** can be TMS320VC5416 signal processors, available from Texas Instruments, Inc., Dallas, Tex.

As can be seen from FIG. **5**, the TV **100** is broadly divided into three main parts, each controlled by a separate CPU. Of course, other architectures are possible, and FIG. **5** only illustrates an example architecture. Broadly stated, and without listing all of the particular processor functions, the television processor **106** controls the television functions, such as changing channels, changing listening volume, brightness, and contrast, etc. The media processor **110** encodes audio and video (AV) input from whatever format

it is received into one used elsewhere in the TV **100**. The digital video processor **120** is responsible for decoding the previously encoded AV signals, which converts them into a signal that can be used by the panel driver **104** to display on the LCD panel **102**.

In addition to decoding the previously encoded signals, the digital video processor **120** is responsible for accessing the PCMCIA based media **128**, as described in detail below. Other duties of the digital video processor **120** include communicating with the television processor **106**, and hosting an IP protocol stack. In alternate embodiments the IP protocol stack may be hosted on processor **106** or **110**.

A PCMCIA card is a type of removable media card that can be connected to a personal computer, television, or other electronic device. Various card formats are defined in the PC Card standard release 8.0, by the Personal Computer Memory Card International Association, which is hereby incorporated by reference. The PCMCIA specifications define three physical sizes of PCMCIA (or PC) cards: Type I, Type II, and Type III. Additionally, cards related to PC cards include SmartMedia cards and Compact Flash cards. Type I PC cards typically include memory enhancements, such as RAM, flash memory, one-time-programming (OTP) memory and Electronically Erasable Programmable Memory (EEPROM). Type II PC cards generally include I/O functions, such as modems, LAN connections, and host communications. Type III PC cards may include rotating media (disks) or radio communication devices (wireless).

The TV system **100** can connect to a computer or an information network either through a wired or wireless connection. A wired connection could be connected to the digital video processor **120**, such as a wired Ethernet port, as is known in the art. Additionally, or alternatively, the TV system **100** can connect to an information network through a wireless port, such as an 802.11b Ethernet port. Such a port can conveniently be located in one of the PCMCIA cards **128**, which is connected to the media processor **110** and the digital video processor **120**. Either of these processors **110**, **120** could include the network protocols and other necessary underlying layers to support network commands on a network client or host running on the processors **110**, **120**.

The system described above can use dedicated processor systems, micro controllers, programmable logic devices, or microprocessors that perform some or all of the operations. Some of the operations described above may be implemented in software and other operations may be implemented in hardware.

For the sake of convenience, the operations are described as various interconnected functional blocks or distinct software modules. This is not necessary, however, and there may be cases where these functional blocks or modules are equivalently aggregated into a single logic device, program or operation with unclear boundaries. In any event, the functional blocks and software modules or features of the flexible interface can be implemented by themselves, or in combination with other operations in either hardware or software.

Having described and illustrated the principles of the invention in a preferred embodiment thereof, it should be apparent that the invention may be modified in arrangement and detail without departing from such principles. I claim all modifications and variation coming within the spirit and scope of the following claims.

The invention claimed is:

1. A share discovery system, comprising:

a computer configured to conduct a device name query by addressing and sending one or more packets using a predetermined broadcast Internet Protocol (IP) address, the presence of the predetermined broadcast IP address in the packets causing remote devices located on a same Local Area Network (LAN) as the computer to provide their IP address to the computer responsive to observing the predetermined broadcast IP address contained in the packets;

the computer configured to correlate received responses to the sent packets to discover the IP addresses of the remote devices;

the computer configured to address and send share queries to the remote devices using the discovered IP addresses, the share queries requesting the remote devices to identify available share folders or files located on the remote devices;

the computer configured to assemble a list of the remote devices and available share folders or files located on the remote devices, the list assembled using information obtained using the share query; and

the computer configured to mount one or more of the listed share folders or files according to user selections such that the mounted share folders or files are not downloaded to the computer during the mounting but are made utilizable by the computer as if stored on the computer;

wherein the device name query and the share query are sent from the computer to the remote devices on the network and receive responses from the remote devices back to the computer without going through an intermediary master browser;

wherein the device name query is conducted using a NetBIOS name query and the share query is conducted using a NETrShareEnum query.

2. The share discovery system according to claim **1** wherein the device name query identifies Server Message Blocks (SMBs) and Common Internet File System (CIFS) servers on the network.

3. The share discovery system according to claim **1** wherein the computer automatically mounts one or more discovered share folders.

4. The share discovery system according to claim **1** wherein the computer displays the list of remote devices and available share folders or share files and then mounts any of the share folders or share files selected from the displayed list.

5. The share discovery system according to claim **1** wherein the user selects the available share folders to mount from a displayed list.

6. The share discovery system according to claim **1** wherein the computer stores the list of remote devices and available share folders or share files in memory and displays the list during a subsequent share session before conducting another device name query and share query.

7. The share discovery system according to claim **6** wherein the computer automatically attempts to mount any share folders or share files in the stored list that were previously mounted prior to conducting another device name query and share query.

8. The share discovery system according to claim **1** wherein the computer is a television computer system coupled to the network that discovers other network devices including remote computers or other television or audio systems on the network that contain media folders and files, the television computer system identifying media on the

other network devices previously designated for sharing and playing selected ones of the identified media locally on the television computer system.

9. An apparatus for discovering share folders or share files, the apparatus comprising:

means for conducting a device name query by addressing and sending one or more packets using a predetermined broadcast Internet Protocol (IP) address, the presence of the predetermined broadcast IP address in the packets causing remote devices located on a Local Area Network (LAN) to provide their IP address responsive to observing the predetermined broadcast IP address contained in the packets:

means for correlating received responses to the sent packets to discover the IP addresses of the remote devices:

means for addressing and sending share queries to the remote devices using the discovered IP addresses, the share queries requesting the remote devices to identify available share folders or files located on the remote devices;

means for assembling a list of the remote devices and available share folders or files located on the remote devices, the list assembled using information obtained using the share query; and

means for mounting one or more of the listed share folders or files according to user selections such that the mounted share folders or files are not downloaded during the mounting but are made utilizable as if stored locally;

wherein the device name query and the share query are sent and the responses received, without going through an intermediary master browsers;

wherein the device name query is conducted using a NetBIOS name Query and the share query is conducted using a NETrShareEnum query.

10. The apparatus according to claim **9** wherein the device name query identifies Server Message Blocks (SMBs) and Common Internet File System (CIES) servers on the LAN.

11. The apparatus according to claim **9** wherein the device name query is generated without preknowledge of the IP address of the remote devices.

12. The apparatus according to claim **9** wherein the packets originate from is a Television device configured to play out remotely located media files.

13. A computer-implemented method, comprising:

conducting a device name query by addressing and sending one or more packets using a predetermined broadcast Internet Protocol (IP) address, the presence of the predetermined broadcast IP address in the packets causing remote devices located on a Local Area Network (LAN) to provide their IP address responsive to observing the predetermined broadcast IP address contained in the packets:

correlating received responses to the sent packets to discover the IP addresses of the remote devices;

addressing and sending share queries to the remote devices using the discovered IP addresses the share queries requesting the remote devices to identify available share folders or files located on the remote devices;

assembling a list of the remote devices and available share folders or files located on the remote devices, the list assembled using information obtained using the share query; and

mounting one or more of the listed share folders or files according to user selections such that the mounted share folders or files are not downloaded during the mounting but are made utilizable as if stored locally;

wherein the device name query and the share query are sent, and the response received without going through an intermediary master browser;

wherein the device name query is conducted using a NetBIOS name query and the share query is conducted using a NETrShareEnum query.

14. The computer-implemented method according to claim **13** including using a broadcast address to send the device name query.

15. The computer-implemented method according to claim **13** including using a multicast address to send the device name query.

16. The computer-implemented method according to claim **13** including using the device name query to identify Server Message Blocks (SMBs) and Common Internet File System (CIFS) servers on the LAN.

17. The computer-implemented method according to claim **13** including:

preconfiguring a username and password to one or more of the share files or folders; and

mounting the share files or folders when a received username and password correspond to the preconfigured username and password.

18. The computer-implemented method according to claim **13** including:

associating a username or password with one or more of the share files or folders;

prompting a user to enter the associated username or password when the share files or folders are selected for mounting; and

mounting the selected share files or folders shares only when the correct username or password is entered.

19. A computer comprising one or more processors operable to:

conduct a device name query by addressing and sending one or more packets using a predetermined broadcast Internet Protocol (IP) address, the presence of the predetermined broadcast IP address in the packets causing remote devices located on a Local Area Network (LAN) to provide their IP address responsive to observing the predetermined broadcast IP address contained in the packets:

correlate received responses to the sent packets to discover the IP addresses of the remote devices:

address and send share queries to the remote devices using the discovered IP addresses, the share queries requesting the remote devices to identify available share folders or files located on the remote devices;

assemble a list of the remote devices and available share folders or files located on the remote devices, the list assembled using information obtained using the share query; and

mount one or more of the listed share folders or files according to user selections such that the mounted share folders or files are not downloaded during the mounting but are made utilizable as if stored locally;

wherein the device name query and the share query are sent, and the responses received, without going through an intermediately master browser;

wherein the device name query is conducted using a NetBIOS name query and the share query is conducted using a NETrShareEnum query.

20. The computer of claim **19** wherein the device name query is transferred proactively without waiting for any

relayed host discovery information and without preknowledge of any of the provided IP addresses.

21. The computer of claim **19** wherein the device name query is transferred proactively and independently of whether the computer has discovered any remote network devices on the LAN or any other network.

22. The share discovery system of claim **1** wherein the device name query is broadcast from the computer independently of whether the computer has discovered any device IP addresses other than an IP address for the computer.

23. The apparatus of claim **9** wherein:

the device discovery query is sent independently of whether the apparatus has discovered any device IP addresses other than an IP address for the apparatus.

24. The computer-implemented method of claim **13** wherein the packets are sent independently of whether a computer originating the packets has discovered any IP addresses of any remote devices.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

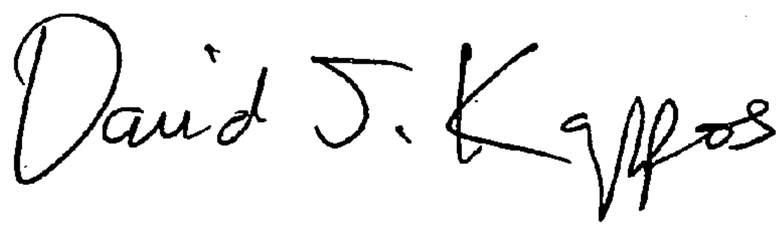
PATENT NO. : 7,366,720 B2
APPLICATION NO. : 10/961285
DATED : April 29, 2008
INVENTOR(S) : Deshpande

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page, item [60] under "Related U.S. Application Data", please remove "provisional application No. 60/535,119 filed on Jan. 6, 2004.".
At column 11, line 33, please replace "master browsers;" with --master browser;--.
At column 11, line 39, please replace "(CIES)" with --(CIFS)--.

Signed and Sealed this

Thirtieth Day of March, 2010



David J. Kappos
Director of the United States Patent and Trademark Office